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ABSTRACT

The Zimbabwe Secondary School Science Project (ZIM-SCI) developed student study guides, corresponding teaching guides, and science kits for a low-cost science course which could be taught during the first 2 years of secondary school without the aid of qualified teachers and conventional laboratories. This ZIM-SCI study guide presents activities and experiments which focus on the characteristics and classification of living things. The major point considered is the number of differences which exist among plants and animals. The study of these differences is used to introduce students to the need for classification. Simple classification exercises based on observed characteristics and activities which involve examining larger animal and plant groupings are included. Other activities include measuring living things, examining normal and random distributions of characteristics, making a collecting net, seeing if plants move, and planting trees. Information to help students understand the scientific principles behind the activities and experiments is also provided. (JN)

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ZIMBABWE SECONDARY SCHOOL SCIENCE PROJECT

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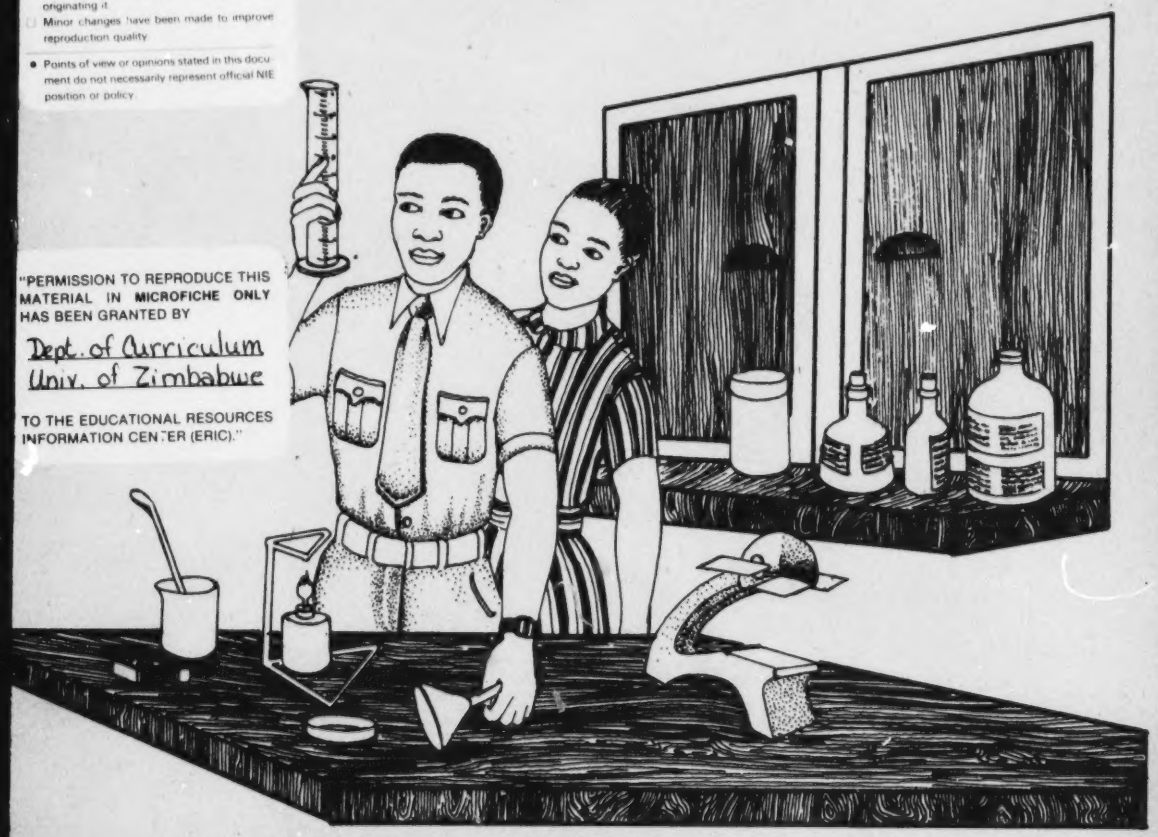

STUDY GUIDE UNIT A2

Looking at Life

SE 043 830

UNIVERSITY OF ZIMBABWE
AND MINISTRY OF EDUCATION AND CULTURE

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APRIL, 1981

Zim - Sci

Zimbabwe Secondary School Science Project

GENERAL SCIENCE

STUDENTS : Please read this carefully. It will help you.

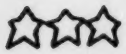
How you will study

This study guide comes to you with a kit of apparatus. Both things are part of a study programme leading you to an understanding of aspects of science. In this course you will be carrying out experiments. The study guide will help you to understand the scientific principles behind the experiments.

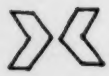
Your work should be done as you are instructed, either by the teacher or the study guide.

To help you to see quickly what you must do, the study guide uses these symbols.

for "Read special notes".

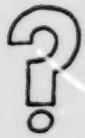


for "Take note of an important point that you should learn".



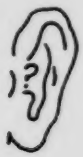
for "Summary". This is to help you to go over what you have learned.

for "Experiment".
When you see this sign, read the instructions carefully from beginning to end before you start to do the experiment.



for "How much do you know?" This is for you, to help you to test whether you are remembering what is important.

for "Written work". This is when you must answer questions in writing.



for Listen to the teacher and do exactly what the teacher tells you to do.

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UNIT A2 : AIMS OF THIS UNIT

At the end of this unit you will be able to :

1. Identify important differences between similar organisms.
2. Explain the differences between a normal and random distribution of characteristics.
3. List two characteristics which show normal and two which show random distribution.
4. Classify a set of objects or organisms on the basis of characteristics.
5. Identify an organism by using a simple key.
6. Plant a gum tree.

GENERAL SCIENCE UNIT A2

LOOKING AT LIVING THINGS

Up to now you have been working mostly with things which are not living - such as your plastic funnel, burner stand, pencil and paper. Non-living things stay unchanged unless something is done to them to make them change. If the same thing is done to them they behave in the same way each time.

For instance, your apparatus will not move unless something moves it. If you heat naphthalene it will melt, if you heat water it will boil. So when you are working with non-living things you can find out definite rules about them.

Biology is the name of the Science which deals with living things.

You have learnt to measure and record your results using instruments which have been given to you.

Another part of being a scientist particularly important in biology is looking at things around you outside the classroom, observing and recording them. Sometimes it is a good idea to bring things into your class from outside. Your class should make what scientists call a collection.

MAKING A COLLECTION

When you are outside keep your eyes open for interesting things which you would like to examine in the class.

Here is a list of items to look out for, and collect :-
(Please DO NOT bring smelly or rotting objects).

Snail shells

Dead and dry beetles, butterflies, dragon flies and other similar insects

Crab shells

Seed pods, grass seed heads, different shapes of seeds, different types of leaves and flowers (do not pull out plants from the ground - only break off pieces)

A piece of egg shell

A small bone from some meat you have eaten

Clean fish bones (a whole skeleton would be good if you have a fish to eat)

Fish scales

(Never pick up animal bones from the bush or you may get a disease from them)

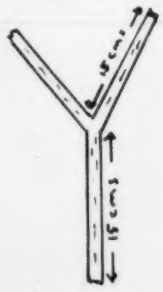
Zongororo rings. When a zongororororo has been dead for some time you can find clean rings from its skeleton.

Here is a list of things you need to help you make this collection :

Old clean paper and plastic bags, tins or other containers will be needed too!

Keep a plastic bag in your pocket in which to put things for your collection. They will please your teacher and help your class very much.

A forked stick about 20 - 30 cms long

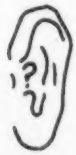


Measuring living things

You may have already noticed from your work on other pupil's pulse rates that there was no definite rule as to what a persons pulse rate would be. You could only say what it was most likely to be.

In Biology we can, by studying many living things, find out what a certain kind of animal or plant is likely to do. (Even in a set of plants or animals which look all alike to us, we will find many small differences).

Look back in your notebooks to the record of the class pulse rate you made. Your teacher will help you get all the readings together on the blackboard and make a histogram of them. Copy it into your notebooks.



Your teacher will also show you how a curve can be made by roughly joining up the tops of the blocks in the graph.

The curve will be like this and is called a normal curve.

You must have heard people say "My, but that boy is tall for a 12 year old!" This is because they expect most 12 year olds to be a certain height and they notice it when one is taller or shorter. The height of most boys of that age is known as the normal height. A few boys will be shorter than normal and a few will be taller than normal.

What is the most usual height of the pupils in your class?

Experiment 1 Finding the heights of pupils in your class

Your teacher will measure each of you and put the results on the blackboard. Write down your own height in Exercise 1.

Complete Exercise 1 by making a histogram of the results on the blackboard.

Experiment 2 Measuring leaves on a plant

Your teacher will give you a small branch or plant with many leaves on it. What size are most leaves on it?

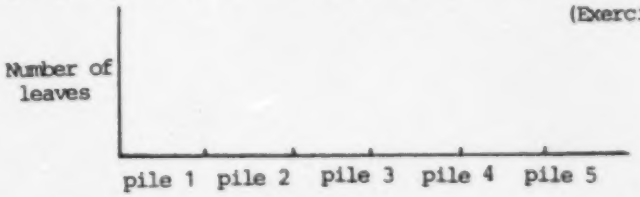
Strip off all the leaves. They come off the same plant - are they all the same size or are some different?

Spread the leaves out on the desk, or on the floor. Pick out any that seem very small. Put them on the left hand side of the desk. Pick out those which seem very big and put them on the right hand side. Divide the remaining leaves into three piles and place them between the biggest and smallest as shown in the diagram.

Do you see the shape of the curve made by the piles? What do we call this shape?

Count the leaves in each pile and make a histogram.

(Exercise 2)



Take one leaf from each pile and draw round each one carefully in your book to keep a record of the different sizes of leaves to be found on your plant.

Experiment 3 What size shoes should you wear?

If you go into a shoe shop the assistant may measure your foot with a special instrument, and tell you what size of shoe you should buy.

Diagram 1 is a copy of one of these instruments and you can use it to measure your shoe size in this way. Remove your shoe, put your book on a clean part of the floor open at Diagram 1 . Get a match box and ask your partner to hold it against the bottom of the page. Now stand on the diagram placing your heel against the matchbox and your partner will read off the number of the shoe size at the tip of your big toe. Do the same for your partner.

Make a note of your shoe size in Exercise 3.

Your teacher will collect all the results on the blackboard.

Complete Exercise 3 by making a histogram of the shoe sizes of the pupils in your class.

SIZE 11

SIZE 10

SIZE 9

SIZE 8

6

5

4

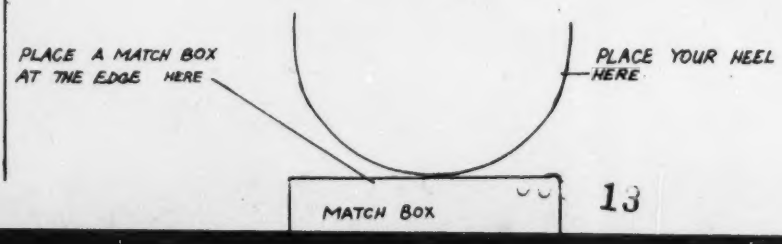
3

2

1

0

Diagram 1. To measure your shoe size



You have looked at some of the characteristics of the pupils in your class, such as pulse rates, heights and shoe sizes. You have also looked at leaf size as a characteristic of a particular plant and you have seen that all these characteristics have a normal distribution.

If you took a lot of mealie cobs you would find that they all had a lot of seeds, but some had fewer and some had more than most. This is another example of a normal distribution.

However, not all characteristics have this sort of distribution. Some pupils in your class will have a certain characteristic that others have not. There is no particular reason or advantage, it just happens to be that way.

Experiment 4 More measurements on yourselves

1. Right or left-handedness

Take up your pencil or pen. Which hand do you have it in? Most people write with their right hand, but some can only write with their left hand.

Are your right handed or left handed? Your teacher will count the number of pupils who are right handed and the number of pupils who are left handed.

Now answer Exercise 4 Question 1 in your books.

2. Have you got an earlobe?

Look at Diagram 2. You will see that some people have an earlobe. Others have no earlobe as shown.

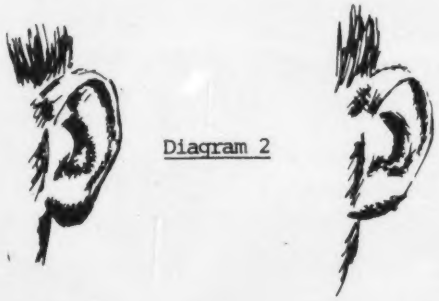


Diagram 2

an ear with an earlobe an ear without an earlobe

You and your partner must look at each other's ears and decide whether you each have a lobe or not.

Your teacher will count the number of pupils who have lobes and also those who have no lobes.

Now answer Exercise 4 Question 2.

3. Can you roll your tongue into a tube?

It is not polite to stick your tongue out atsome-one, but you may do this today without being rude - just scientific! Look at Diagram 3 . Many people can make a tube when they push their tongue out between their lips. Some cannot. Try it! Your partner will watch and tell you whether you are rolling your tongue into a tube or not!

Diagram 3

A tongue which cannot roll into a tube

A tongue rolled into a tube

Your teacher will count the number of tongue rollers, and also those who cannot roll their tongues into a tube.

Now answer Exercise 4, Question 3.

Look at the shapes of the histograms you have drawn in Exercise 4. Are they normal distributions?

In these histograms there are only two blocks. One is much bigger than the other. Such distributions are called RANDOM distributions because they do not fit the normal pattern.

Any distribution which does not fit the normal pattern is called a random pattern.

Most likely characteristics

What characteristics are the most likely ones for a pupil in your class?

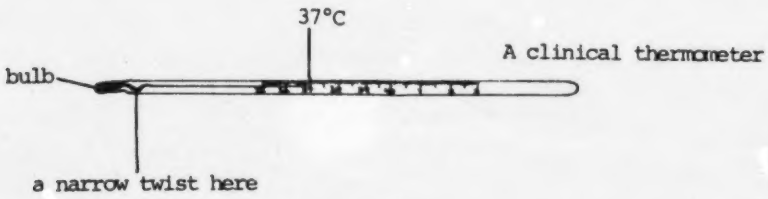
In your notebook make and fill in the following chart using the information you have gathered, to find out what a pupil in your class is most likely to be like.

Most usual pulse rate	Most usual height	Most usual shoe size	Is pupil right or left handed?	Has pupil an earlobe	Can pupil roll his tongue?

Measuring living things - temperatures

You will by now have used an ordinary thermometer to take water temperatures. Have you ever had your temperature taken when you were ill?

A special "clinical thermometer" would have been used.



This has a narrow twist inside, which means that the line of liquid is held in place after the thermometer has been taken out of the warm mouth. The temperature can be read in the cool air. Then the thermometer has to be shaken to get the liquid down into the bulb again.

The scale is marked for a few degrees each side of 37°C. This is about the most common temperature of a well person.

Some temperatures may be sub or below normal and when someone has a fever their temperature may go as high as 2 or 3 degrees C above normal.

Experiment 5 The Clinical Thermometer

Your teacher will show you how to measure temperatures with a clinical thermometer.

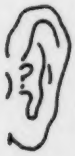
Exercise 5

Make a histogram of the results from the blackboard. Do they show a normal distribution?

Part 2

You have been doing some testing and measuring with living things - mostly people.

You have seen some ways in which living things differ and you now are going to look at some more living things. But how do you know which is a living thing and which is not?



Look at Diagram 4 It is a puzzle picture. Discuss the things you see happening in it with your teacher and the class. Your teacher will draw a chart like the one below on the board and fill it in from your ideas. Copy it into your note book.

Living things	Non-living things
1. 2. 3. 4.	

Which of the following do you think are living things?

(a) a stone (b) a mealie pip (c) a mushroom
(d) orange and green patches on rocks (e) water?

Write down your answers underneath the chart.

Scientists call living things ORGANISMS.

Diagram 4

1,

2,

3,

4

Look at the diagram opposite (Diagram 5)

How many organisms can you count in this picture? Make a list of them in your note book (Exercise 6).

How many more can your class think of? The picture has quite a few living things in it, but in Zimbabwe there are many more. Your teacher will ask each of you in turn for the name of a plant or animal and will write your suggestion up on the board until you all run out of ideas, so get ready with names!

How many did your class think of? At least 40? Perhaps 100? Good. Did you know that in Africa, south of the Zambesi river there are over 800 different kinds of birds alone!

Biologists put living things into many sets or classes and they call this classifying them according to their characteristics.

You will understand the need for this when you think about the birds! The birds belong to different groups or "tribes". Each tribe has similar characteristics. For example, all the "eagle tribe" eats meat.

You can practice classifying with some non-living things in the following experiment.

Experiment 6 Alike and not alike

You have made SETS in mathematics and this should help you now.

Takethe following pieces out of your kit :

The funnel, the spatula, the peg, the burner, the boiling tin, the burner stand, the beaker and the 2 measuring cups. What is the same about all of these? They are all used to do experiments! However, they all have other characteristics by which we can tell them apart : a characteristic such as colour, size, mass, shape, feel, material it is made of and so on.

Group them into 2 sets. You must decide on which characteristic to choose when you do this. Remember you must be able to say "All these pieces in this set are similar because they are all ..... and all the pieces in that set are not like that".

Then divide each set up into two more sets, choosing a different characteristic. Keep on doing this. Make a list like this :

Characteristic chosen for 1st set .....
Characteristic chosen for 2nd set .....
Characteristic chosen for 3rd set .....
Your teacher will now show you how he might choose to do it.

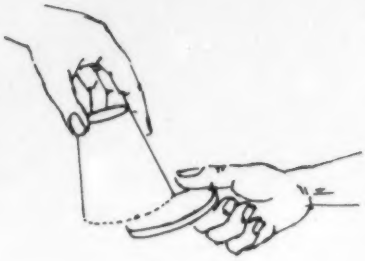
Now you have had some practice in classification, you can attempt to classify a collection.

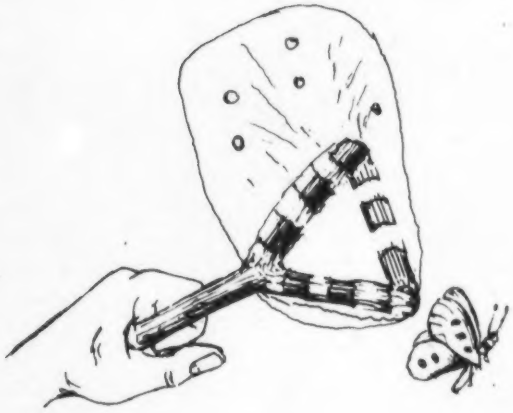
You started your collection at the beginning of this unit. Have you collected many things?

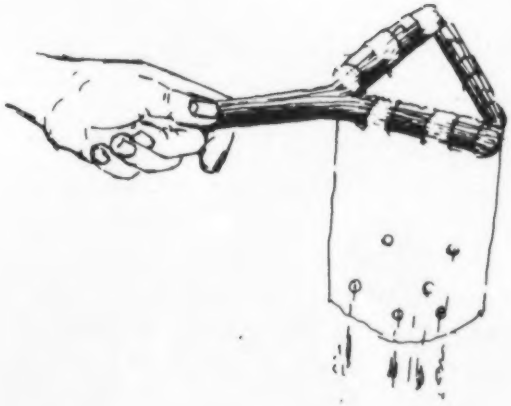
Your teacher has organised an EXPEDITION!

The purpose of this expedition is to collect more living things.

Your teacher will show you how to make a net to collect some living things like butterflies or tadpoles.





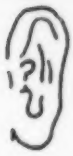


How to use your cup and net to collect living things.

The field expedition

You will need to take with you :

A plastic bath
Your notebook and pen
Your net made from the forked stick
Another stick for pushing things into your cup
Your plastic cups and lids
A plastic bag with tiny hole in it made by a pin



Before you go listen to your teacher as he tells you what to do.

Good luck with your collecting!

When you come back to the classroom, you should label your dried material such as pressed plants and seed pods and all specimens which can be kept and displayed with labels made out like this

Name of collector (put your name here)
Date on which collected _____
Place found _____
Special notes (e.g. colour of flower)
_____
_____

Now answer Exercise 7 below.

Exercise 7

1. Take a leaf from one of the specimens you collected on the trip. Observe and describe it.
   Points to look for
   1. Colour of upper and lower side
   2. Shape - draw this
   3. Edges, what are they like?
   4. The surface
   5. The texture - is it hairy, shiny etc?
   6. Measure the length and breadth.

2. Take a small moving thing (ant, worm etc.) from the specimens you collected. Observe and describe it.
   Points to look for
   1. Colour - on top
      underneath
   2. Surface - dry, damp, hard or soft, hairy, smooth
   3. Is the body one piece or is it divided into parts?
   4. Does it have eyes, feelers, wings, legs - if so how many?
   5. Measure the length
   6. Where was it found and what was it doing?

Look at your collection. You have already done some classifying! All moving things had to be put in a plastic bag or plastic cup to stop them running away!

You think of animals as goats or cows, but Biologists classify ALL living things which MOVE ABOUT as"animals". Therefore insects, worms beetles are animals - even you are an animal!

All living things which do NOT move from one place to another are called "Plants".

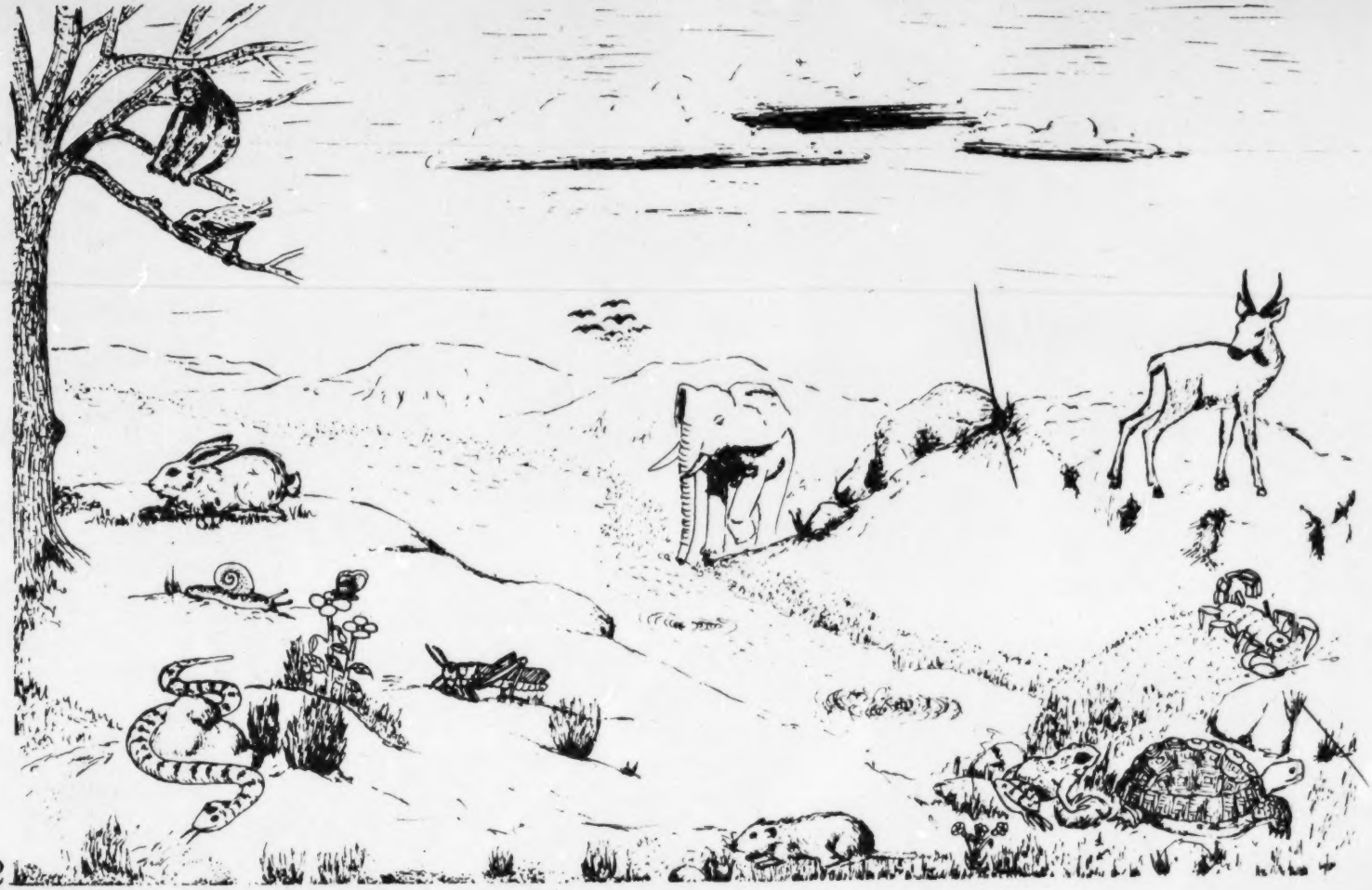
What other differencesare there between plants and animals? You might say that all plants are green but animals are not green.

But not all plants are green - mushrooms are not! A few animals are green - such as some snakes and frogs and birds. These are exceptions of course and that is why Biologists will say "MOST plants are green and MOST animals are not green"!

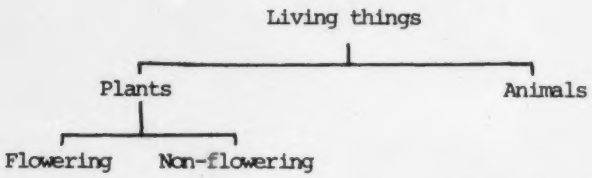
Later on in Science you will study them in more detail and find out more differences.

Now that you realise how many different living things there are in the world, you can see that scientists need to sort them out, according to their characteristics, first into big groups, then into smaller groups just as you did with your sets of apparatus. Think of the big groups you have already seen - living/non-living plants/animals.

Diagram 5



Here is a diagram showing our classification so far, with some plant "tribes" also shown.

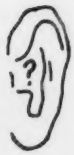


(When we have finished talking about plant "tribes" we shall talk about animal "tribes".)

Plants

Look at the pictures of some plants (Diagram 6)

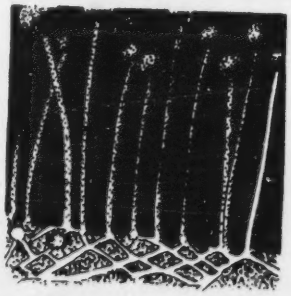
You have all seen grasses and flowers, but many of you may not have seen any non-flowering plants. Mushrooms are common all over the country in the rainy season. Algae which are like green thready cotton wool may often be seen in still water all over the country. Ferns and mosses are found in damp places - sometimes in cool spots under rocks in kopjes and of course in the Eastern districts. All of these are non-flowering plants. Try and find some of these for your class collection.



Your teacher will have a non-flowering plant to show you now.

Perhaps you never thought of this stuff which you find on rotten bread as a living plant!

PLANTS (Diagram 6)

Some flowering plants	Some non-flowering plants
grass spike	mushroom
pea flower	fern
a tree leaf	 mould (magnified)

THE ANIMAL BRANCH

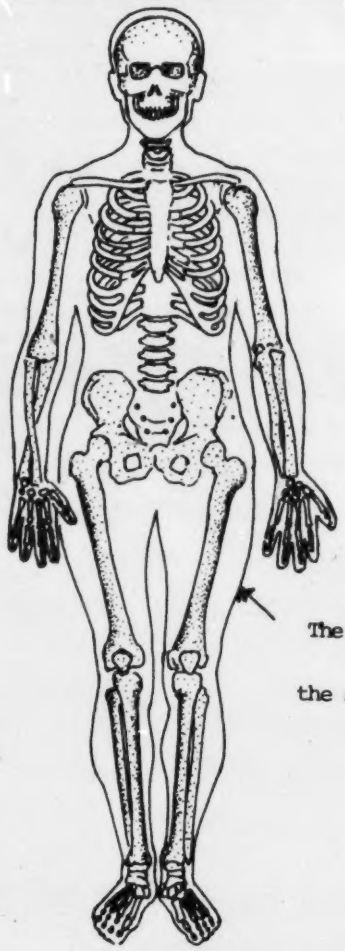
Let us look at the animal branch now. Feel your arm near the wrist. There is a soft outer covering with something hard inside. Feel your fingers, your upper arm, your chin - they will feel the same. Feel from the back of your neck right down the ridge of your back to your waist. You have ribs around your chest. This hardness is bone inside your flesh.

You are full of bones! You have a frame which holds you in shape. Without it, you would be a shapeless thing. You have a row of bones right down your back. Each bone is called a vertebra bone. Together they make up the "vertebral column" sometimes called the backbone.

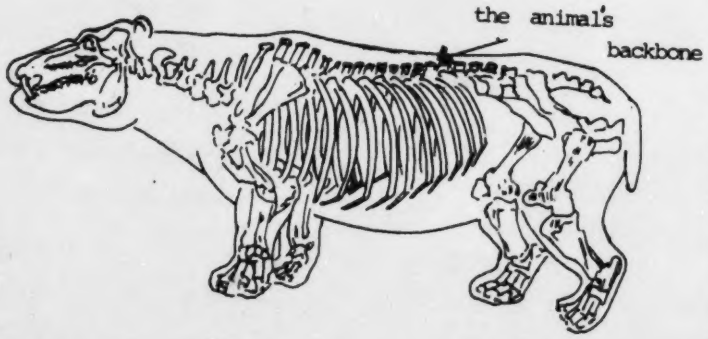
Your arms, legs, skull and rib bones are all attached to this backbone in one way or another and so it is the most important part of your frame. Have a careful look at a cow or a dog next time you see one and you will see this ridge along the back - the vertebral column.

You may be surprised to learn that fish and frogs and snakes and crocodiles and chameleons all have backbones - even birds do too!

Diagram to show that vertebrate skeletons are inside the flesh



The inside skeleton of a man



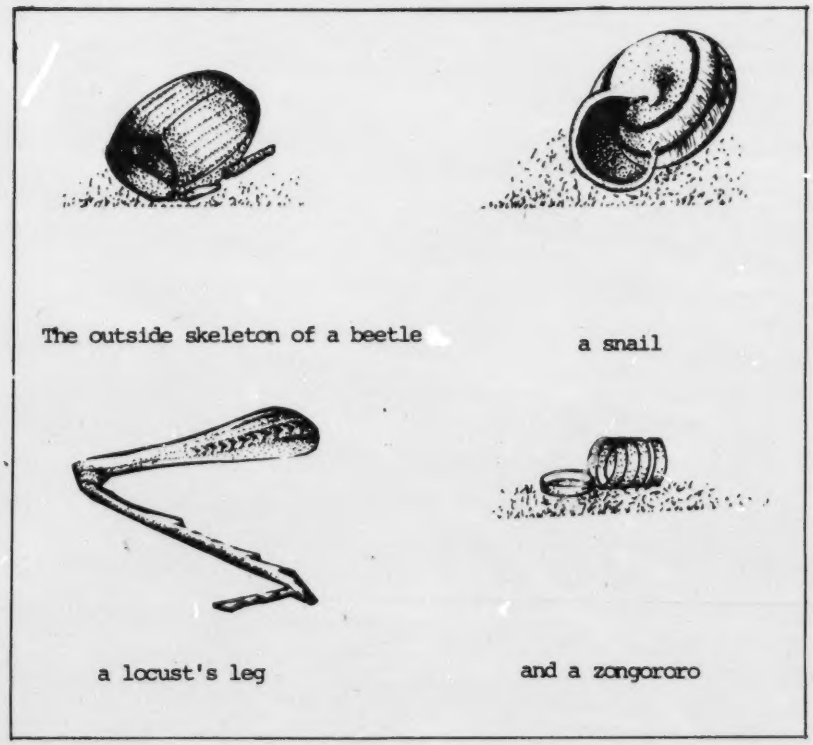
The inside skeleton of a hippo

Do you think a fly or a spider has a backbone? Think about a tick you may have squashed, or a beetle - did you see any white bones inside? I am sure you did not, whereas you know if you eat chicken or fish or any other meat there are bones inside.

Certain animals have an inside skeleton form, whereas others are kept in shape by a stiff outside skeleton which is quite different to ours. It may be a leathery skin like a tick or spider, or a hard shell such as you find in a dung bettle or a crab. Animals with a vertebral column or a bony skeleton are called VERTEBRATES and can grow to a large size as this frame can support a greater mass.

Those without the inside skeleton, like ticks and bettles, are called INVERTEBRATES.

Diagram to show that Invertebrate skeletons are outside the flesh



Vertebrates are divided into 5 main "tribes". Here the differences between the groups should be quite easy for you to see. Look at the pictures on the next page.(Diagram 7)

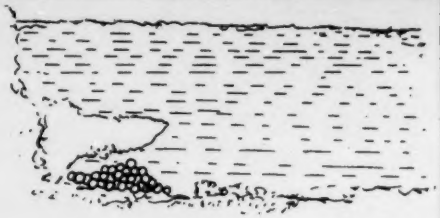
"Tribe"	Skin covering	Young	Living place
1. Fishes e.g. bream	scales	soft eggs	lives in water
2. Amphibian e.g. frog	soft and damp skin	soft eggs laid and hatched in water	lives on land
3. Reptiles e.g. lizard	dry scaly skin	eggs with leathery shell laid on land	lives on land
4. Birds e.g. eagle	feathers	eggs with hard shells laid in nests	lives on land
5. Mammals e.g. cow	hair	born alive	lives on land

Which of these "tribes" do you belong to?

Diagram 7 THE VERTEBRATES

FISHES

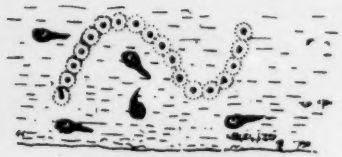
covering of scales



soft egg laid in water

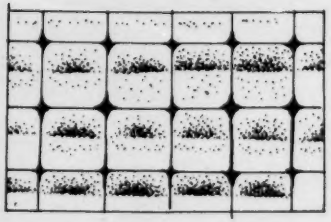
AMPHIBIANS

damp skin



soft eggs which are laid and hatch in water

REPTILES

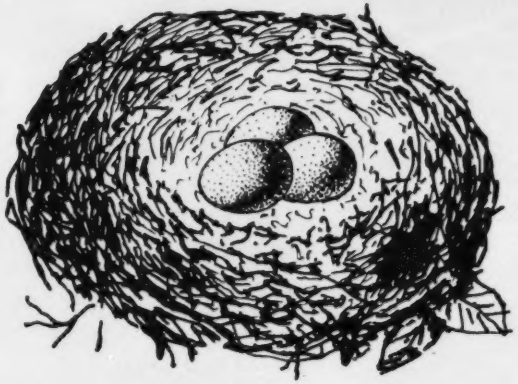


dry scaly skin

leathery shelled eggs laid on land

BIRDS

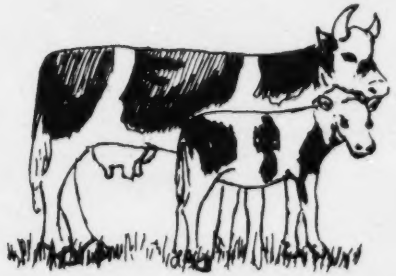
feather covering



hard shelled
eggs in a nest

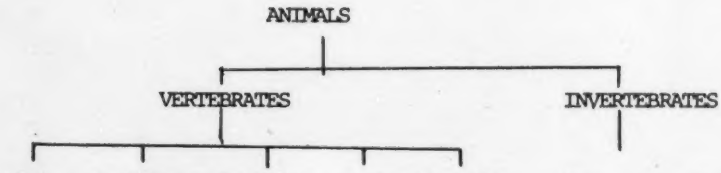
MAMMALS

hair covering



young born live
fed on milk

Now we can make the animal branch of the chart.



Here are a few examples of invertebrates :

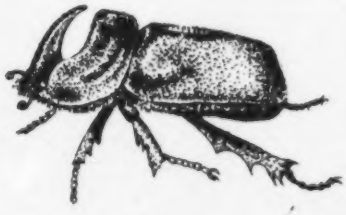
worms
slugs
zongororos
crabs
spiders
insects

There are many more different "tribes" or varieties of invertebrates than there are of vertebrates - about 54 000 kinds of vertebrates and 896 000 of invertebrates, isn't that an amazing number?

The invertebrates show great variety. Some live in water, some have wings and fly. Most are small. Some have many legs (zongororo) some 8 legs (ticks and spiders). All insects have 6 legs and some have wings too. Many are useful to man, such as bees and spiders, but others are a nuisance because they spoil food and eat crops.

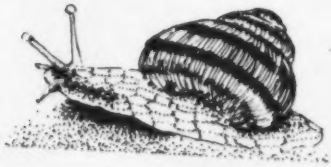
Here are the pictures of some small animals which another class found near their school.

slug

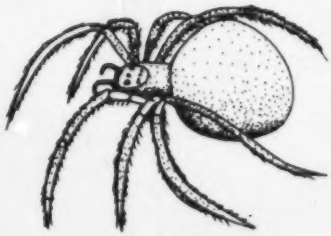


rhino beetle

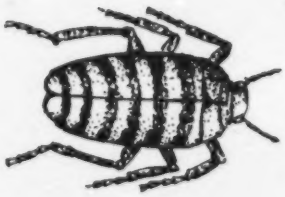
earthworm



snail



spider



tiger beetle

zongororo

They decided to make a key which they could use to sort out their animals.

This key is on page 31

Now look at the picture of each animal in turn and see how the key works.
Study this very carefully as it is difficult and it may take you some time to understand how to do it.

Imagine you have four small invertebrates and you need to find their relatives. Here are their descriptions.

Animal number one is long and thin, it feels hard and has many legs.

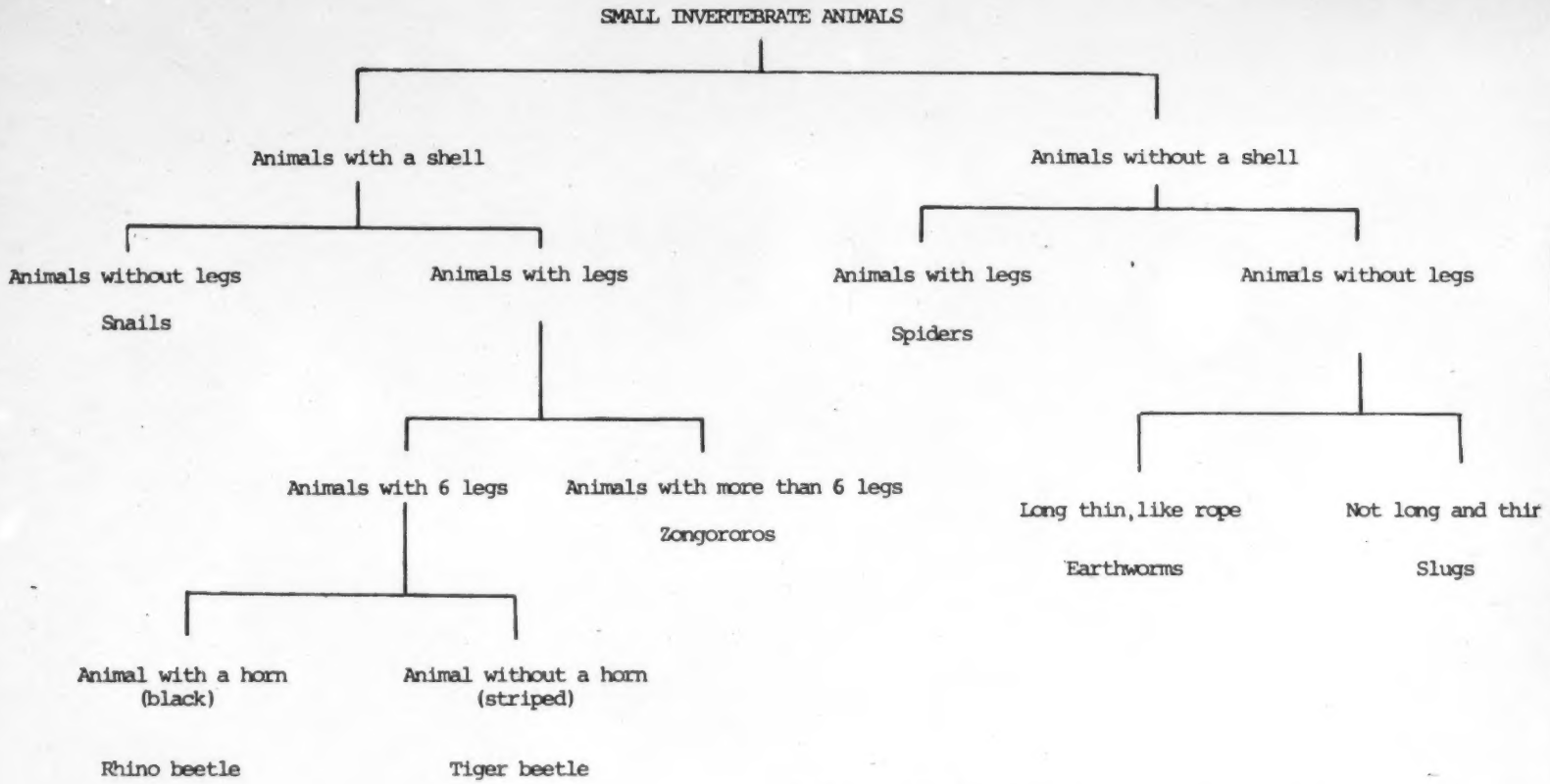
Animal number two is black, soft and slimy. It is flat and not very long. and has no legs

Animal number 3 is black, hard and has 6 legs.

Animal number 4 is soft and slimy. It is long and thin and brown and has no legs.

Your teacher will help you with the first animal, then it is your turn.

Find the relatives of all the animals and answer exercise 9.



A chart or key to sort out some small invertebrate animals

Exercise 10

A farmer was woken up one night by noises in the bush near his house. He went to look but it was very dark and he could only see a big dark shape moving off. He could not tell what sort of animal it was, but the next morning he found some footmarks in the mud.

Here are some pictures of the footprints of the big animals which are common where he lives.

Make a list of any differences you can see and use them to make a KEY which the farmer could use to identify any big animal which may visit his farm in the night.

Rhinoceros

Lion

Zebra

Antelope

Elephant

Buffalo

Hippopotamus

Cheetah

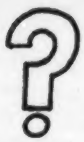
HOW MUCH DO YOU KNOW?

Copy out these sentences in your book filling in the missing words.

1 A normal distribution curve is this shape .....

2 Left handedness has a ..... distribution pattern

3 We can say that most .....are green.



4 Animals with backbones are called .....

5 ..... have an outside skeleton

6 Insects have ..... legs

7 An organism is a .....

8 Fish have a covering of .....

9 Animals with a dry scaly skin are called .....

10 Birds lay eggs with .....shells

11 Amphibia lay .....eggs in .....

12 A key is for .....

13 Fill in four main characteristics of living things

They are .....

They all .....

They can .....

They need .....

STUDY OF A SMALL INVERTEBRATE ANIMAL

What do you like to eat? Why do you live in a house? Did you notice on your field trip that different kinds of animals live in different place? Some live in trees, some under rocks and so on. Why is this? It is because each animal knows the place that it needs. It has several needs. It needs the right food supply and it needs shelter - just as you do!

Some animals with a soft covering need to hide away from birds which want to eat them. They may need to be in the damp places under stones as their skin is not protected from the sun's heat. Grasshoppers may be found on fresh juicy plants which they eat and mice on the ground where they search for seeds. Birds shelter in trees where they are safe from some big animals which like to eat them.

If you want to keep animals in the laboratory it is of course important to find out that they eat and what sort of conditions they need to live.

How can you do this? If you collect a small animal in the field you must be careful to make a note of the sort of things around it. Did you find it in the soil? Did you find it near or in water? Was it eating anything? You can then get a container and put in it some of the things which you think it might like to eat. Try to provide a choice of places where it may like to live. If you give the animal a choice of foods and places to live, it will choose the one which suits it best.

Perhaps you found some earthworms on your field trip. A likely place would have been in your vegetable garden, or near a river. In case earthworms are difficult to find near your school, your class has been sent some.

To look at them better you will need to use a HANDLENS.

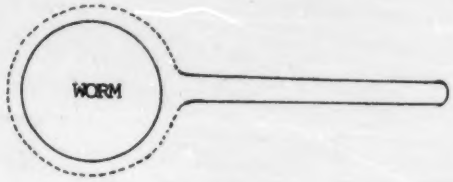
How to use your hand lens

Your teacher will give you a tool which looks like this:

A HANDLENS -- 44

The shaped glass is like the glasses some people wear to help them to see better. This hand lens will help you to see small things better as the glass is specially shaped to make them look bigger. It magnifies them. It is sometimes called a MAGNIFYING GLASS.

Take yours and place it flat on this page with the glass over the word worm below.



Hold the handle and slowly lift the handlens up off the page towards your eye. Watch the word WORM through the glass as you do so. It will seem to get bigger and bigger. When it is big but still clear it is in FOCUS and this is the best point to look at things. Try doing this again and then focus on other things such as your sleeve or the wood of your desk. The handlens works best when your eye is kept close to it. Try moving nearer or further away and find out the best point of focus for you and your lens.

Now you can use it to examine living things such as your earthworm, the heads of flies and mosquitoes. You will find it very useful.

Studying the earthworm

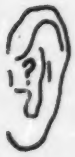
Your teacher will give you an earthworm to look at now. Earthworms cannot hurt you, they are quite harmless. You may have used them to catch fish!

Use your hand lens to examine it.
What shape is your worm?
What colour is it?
Does it have any marks on it?
How does it move?
Does it have a head end and a tail end? (How can you tell?)
What sort of covering does it have?
What happens when you touch the worm
What does it feel like? Dry? Slippery? Damp? Slimy? Scratchy?
Do you think it has a top surface and an under surface? -are they different colours? Is one smoother than the other?

Experiment 7 : Observing the way an eathworm moves

Place a worm on a sheet of paper on top of your boiling tin. Can you hear it move? Listen carefully.
Feel carefully the undersurface of the worm and look at it with the hand lens. Can you see any tiny hairs? These help it to grip and move.

Watch the lines on the worm's body. Can you work out how it moves?



Now listen to your teacher.

Now do Exercise 9.

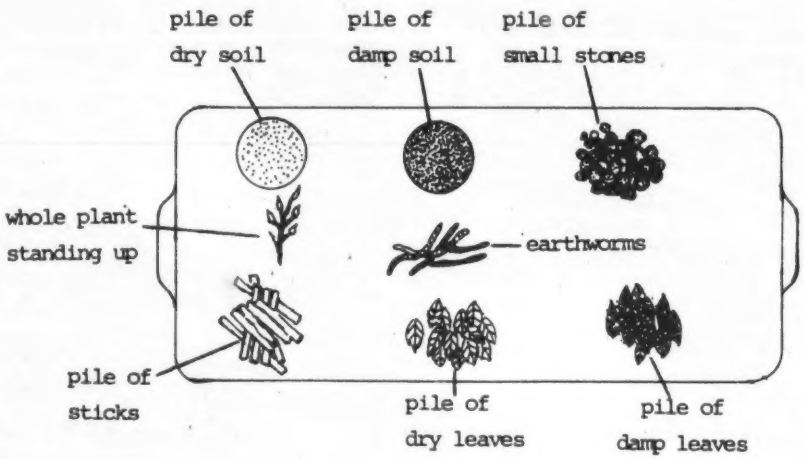
Exercise 9

Write a description of the earthworm and how it moves. (The questions we asked you will help you to write this exercise).

Experiment 8 : To see what sort of place a worm wants to live in.

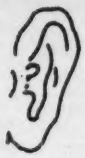
Your teacher will ask you to fetch some of the following and make piles in a plastic bath.

1. Dry soil
2. Damp soil
3. Dead leaves (dry)
4. Dead leaves (wet)
5. Dry sticks
6. Stones
7. A plant standing up off the bottom.



Release the worms in the centre of the bath and make a guess about where they will choose to live and leave them for a day or two. Later examine each pile and see where the worms are.

Was your guess right about where they like to live?



Now that you have found out the sort of place earthworms choose to stay in, your teacher will make such a place. It is called a wormery. Watch carefully what he does. He will tell you why he is making it in such a strange way.

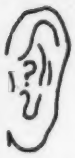
Experiment 9. What do worms eat?

Please several things which you think worms may like to eat on the surface of the wormery.

Try these : pieces of grass
pieces of meat
pieces of dry leaf and grass
pieces of potato, tomato
pieces of sadza.

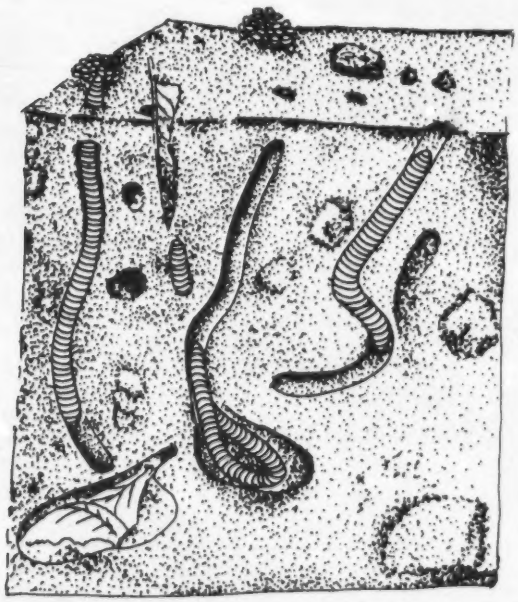
Look at the wormery every day and try to work out what food the worms have chosen.

Now answer Exercise 10.

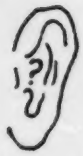


Your teacher will show you the wormery again

and tell you about the importance of earthworms



You have collected many different living things from an area near your school. You found that the different kinds of plants and animals live in different sorts of places. You would expect to find fish or crabs or crocodiles living in water - and butterflies or goats on land!



Your teacher put some grass, water and soil into a bottle a week ago. Do you think there are any kinds of animals living in this sort of place?

Look carefully in the bottle - can you see anything? Most likely you will not see any live things in the water.

Perhaps there are some animals in this place but they are too small to see?

Experiment 10. Looking for very small life

You will need : your magnifying glass
a plastic bottle
a dropper
a glass side
} from basic kit

Your teacher will give you some of the water from his bottle. Put a drop of the water on the glass slide and use the magnifying glass to look for small moving things.

Did you find anything?

IMPORTANT

The water from the bottle may be dirty and smelly so wash your hands well after this exercise.

Maybe your magnifying glass is not strong enough. In fact it only makes things look about five times bigger than they really are.

Your teacher has an expensive tool or instrument called a microscope. This has several special glass lenses in a row. Each lens makes a very small object look bigger in turn so that it eventually looks much bigger.

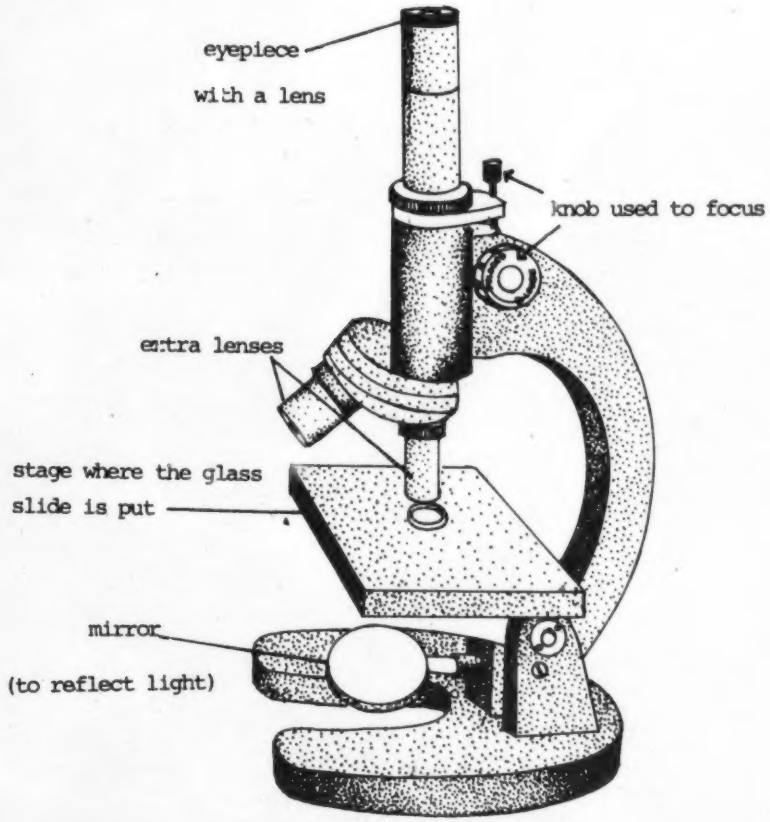
Take your lens and focus on the word "water" below.

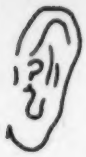
WATER

Borrow another lens and focus on your lens - the word now looks even bigger.

Here is a diagram of a microscope which does this better than your two lenses and magnifies many times. Using this instrument you can make things look 100 times bigger than they really are!

THE MICROSCOPE





As you have not used one before your teacher will demonstrate how to use it. Watch carefully and he will tell you all about it.

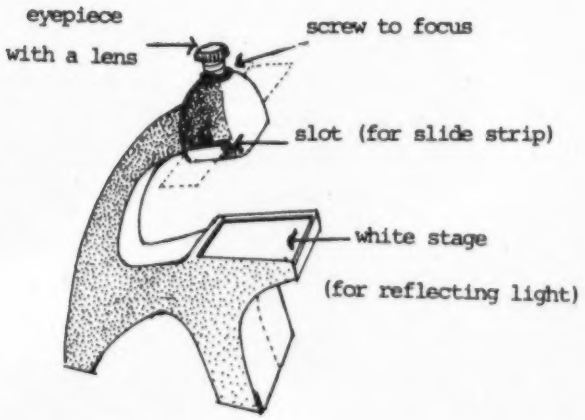
He will then put a glass microscope slide which has a drop of water on it onto the microscope stage. He will focus it for you. HAVE A LOOK!

Some small animals may swim past rather fast and you may not see them very well. Keep looking. Even if you only see one animal it will be enough to make you believe that such tiny things are actually alive and living in the bottle of water and soil.

The Bioviewer

You and your partner will be given a BIOVIEWER. This is a simple sort of microscope to help you get used to using this sort of instrument. When you are more experienced you will go on to use a big microscope such as the teacher has used today.

THE BIOVIEWER



Your bioviewer has a lens at the top which you can focus by turning the black part which is a screw. The white stage is in place of a mirror and reflects light up to your eye. The main difference is that you will not use a slide - instead there is a slot on the side into which you will push a slide strip. These slide strips are actual special transparent photographs of real slides. They are not just drawings. You will be able to learn to draw from a microscope by looking down your bioviewer. Try to do this with both eyes open. It is easier for your eyes this way.

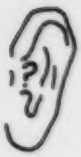
Experiment 11. Looking at other very small animals with the Bioviewer

Take up the slide strip you have been given and look carefully at each slide using the bioviewer. You will see (greatly magnified of course) small animals which live in a pool or water tank. You will be amazed and want to know what they are! You will be able to identify them from the envelope which comes with the slide strip.

Read about each slide, and draw the animal on it. This will help you to observe the characteristics of the tiny living things which are called microscopic organisms. (Exercise 11.)

You will be seeing more life under the microscope in Unit E.

One of the characteristics of living things is that they can move. You have observed many animals big and very small moving about, but you may find it more difficult to believe that plants move.



Look at the bean plants which your teacher planted weeks ago. Can you see anything which tells you that parts of these plants have moved?

Your teacher will discuss this with you.

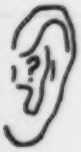
TREES

One of the most important plants growing in Zimbabwe is a tree.
What do you think the importance is of a tree?
Can you think of 4 good uses for trees? (Exercise 12)

Experiment 12 Planting a tree

You may have grown vegetables but have you ever grown a tree? Do you know how?

You will be given some seed and instructions so that you can grow a small tree in a bag. Next year your school will decide where to plant them out from their plastic bags. Then they can grow tall and be useful to your village.

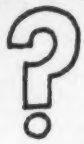


Your teacher will give you a plastic bag and talk to you about planting your tree.

Now you have completed your first Biology unit. You have learnt about living things and observed some of their differences.

Look back now at the aims of this unit. You should now understand each one. If not, read again those parts of the unit.

You will learn more about living things later in the year.



HOW MUCH DO YOU KNOW?

Copy out these sentences in your book filling in the missing words.

1 A handlens is for .....

2 An earthworm lives in ..... and likes to eat .....

3 An earthworm has small ..... underneath to help it move

4 A very small living thing which cannot be seen with the eye alone may be seen using a .....

5 Trees are useful to man because
.....
.....
.....
.....

What you have learnt in this unit

1. There are very many different living things in this world. Living things are called organisms.
2. Even things which appear the same may have some differences.
3. These differences may have a normal or random distribution.
4. Organisms in the world can be sorted out according to the differences in their characteristics.
5. You should be able to distinguish between
   (a) living and non-living things
   (b) plants and animals
   (c) some flowering and non-flowering plants
   (d) vertebrates and invertebrates
   (e) the five groups of vertebrates
   fish, amphibians, reptiles, birds and mammals.
6. There are many more different types of invertebrates than vertebrates.
7. Scientists need to sort out all these many different living things and so they make keys. Keys are clues to enable people to find out where something belongs.
8. You have studied an earthworm and found out characteristics of
   (a) its appearance
   (b) its needs - cool damp soil, vegetable matter to eat
   (c) its behaviour
   (d) its usefulness.
9. You have planted a tree.

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